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SCORPAENODES IMMACULATUS, A NEW SPECIES OF SCORPIONFISH (OSTEICHTHYES: SCORPAENIDAE) FROM WALTERS SHOALS, MADAGASCAR RIDGE

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Abstract.—*Scorpaenodes immaculatus* is described from a single specimen collected in shallow water (40–49 m) at Walters Shoals in the southwestern Indian Ocean. It differs from all known species of the genus in lacking dark markings on the head, body, and fins. The new species is most similar to *Scorpaenodes smithi* Eschmeyer & Rama Rao, but differs from it in the absence of a dark spot over the posterior part of the spinous dorsal fin, the absence of bars and other dark markings over the body, in having a small spine on the upper arm of the preopercle, and in having the upper unbranched rays in the pectoral fin slightly elongate.

A shallow water trawl collection made in December 1988 during cruise 17 of the Soviet oceanographic vessel *Vityaz* in the southwestern Indian Ocean (Collette & Parin 1991) resulted in the discovery of a new scorpionfish of the genus *Scorpaenodes* Bleeker. The new species, represented by a single specimen, was taken in shallow water (40–49 m) at Walters Shoals, an isolated submerged oceanic mountaintop that rises to within 18 m of the surface, 400 nautical miles south of Madagascar and 600 nm east of South Africa (33–35°S, 43°50–56′E).

Scorpaenodes is distinguished from other scorpaenid genera by the following combination of features: a low spinous dorsal fin, usually with XIII spines (sometimes XIV), and absence of an occipital pit and palatine teeth. Like many other scorpionfish genera, it is poorly defined. The genus has been divided by some authors (e.g., Smith 1957), but recent work has followed Matsubara (1943) and Eschmeyer (1969a) in recognizing a single genus. With the description of *Scorpaenodes immaculatus,* the genus now includes about 25 species.

The purposes of this paper are to describe the new species so that the name is available for subsequent analysis of the Walters Shoals fish fauna, and to compare it with other species of the widely distributed genus *Scorpaenodes.* In addition, we take the opportunity to list the described species in the genus (Table 1).

Materials and methods.—Counts and head spine terminology follow those of Eschmeyer (1969b). Measurements were taken as specified in Poss (1982). Scale terminology and the methods of cleaning the scales follow Hughes (1981), except the concentration of sodium hypochlorite was reduced to 0.5%. Scales were photographed using an Olympus SZH binocular light microscope.

The acronym USNM designates the Division of Fishes, National Muscum of Natural History, Smithsonian Institution, Washington, D.C., where the holotype and only specimen is deposited; CAS, the California Academy of Sciences in San Francisco which houses much of the comparative material.

Scorpaenodes immaculatus, new species
Figs. 1–3

Holotype.—USNM 307748; 89.2 mm SL; western Indian Ocean, Walters Shoals,

Table 1.—Nominal species of *Scorpaenodes* and their distributions.

Species	Author	Distribution
africanus	Pfaff 1933	eastern Atlantic
africanus	Smith 1958	= *albaiensis*
albaiensis	Evermann & Seale 1907	Indo-West Pacific
arenai	Torchio 1962	Mediterranean Sea
asperrimus	Smith 1958	= *parvipinnis*
brocki	Schultz 1956	= *minor*
caribbaeus	Meek & Hildebrand 1928	western Atlantic
corallinus	Smith 1957	Indo-West Pacific
elongatus	Cadenat 1949	eastern Atlantic
englerti	Eschmeyer & Allen 1971	Easter Island
erinacea	Garman 1903	= *guamensis*
floridae	Hildebrand 1940	= *tredecimspinosus*
guamensis	Quoy & Gaimard 1824	Indo-West Pacific
hirsutus	Smith 1957	Indo-Pacific
immaculatus	Poss & Collette 1990	Walters Shoals
insularis	Eschmeyer 1971	St. Helena
investigatoris	Eschmeyer & Rama Rao 1972	western Indian O.
keelingensis	Marshall 1950	= ?*kelloggi*
kelloggi	Jenkins 1903	western Pacific
littoralis	Tanaka 1917	Indo-West Pacific
minor	Smith 1958	Indo-West Pacific
minutus	Cuvier 1829	= ?*guamensis*
muciparus	Alcock 1889	Indo-West Pacific
parvipinnis	Garrett 1864	Indo-West Pacific
polylepis[1]	Bleeker 1851	= *guamensis*
scaber	Ramsay & Ogilby 1886	= ?*guamensis*
smithi	Eschmeyer & Rama Rao 1972	western Indian O.
steeni	Allen 1977	Western Australia
steinitzi	Klausewitz & Froiland 1970	Red Sea
tredecimspinosa	Metzelaar 1919	western Atlantic O.
tribulosus	Eschmeyer 1969	western Indian O.
varipinnis	Smith 1957	Indian Ocean
xyris	Jordan & Gilbert 1882	eastern Pacific O.

[1] Type-species of *Scorpaenodes* Bleeker 1857.

33°11′S, 43°52′E; 40–49 m; 29-m fish trawl; *Vityaz* Cruise 17, Sta. 2685; 12 December 1988; only known specimen.

Diagnosis.—An entirely red species of *Scorpaenodes* without dark markings on body and fins. It is also separable from other species of *Scorpaenodes* by a combination of differences in spination, counts, and measurements (see below, comparisons).

Description.—Dorsal-fin rays XIV, 8½, (count of XIII, 9½ should be expected). Anal-fin rays III, 5½. Pectoral-fin rays 19, rays 2–8 or 9 branched. Lateral line damaged, but with about 27 scales, with last scale extending over base of caudal fin. Gill rakers 5+1+10 (left); 6+1+10 (right). Caudal fin with 12 branched rays (6 ventral; 6 dorsal), 15 segmented rays (7 ventral; 8 dorsal), and 8 unsegmented, procurrent rays (4 dorsal; 4 ventral). Vertebrae 9 precaudal + 15 caudal = 24.

Head moderately large; relatively deep posteriorly. Infraorbital one with suborbital ridge, but without spine. Three lobes on infraorbital one extending over maxilla, one anteriorly, two posteriorly; none ending in pungent spine. Infraorbital two with strong ridge ending in distinct spine near junction

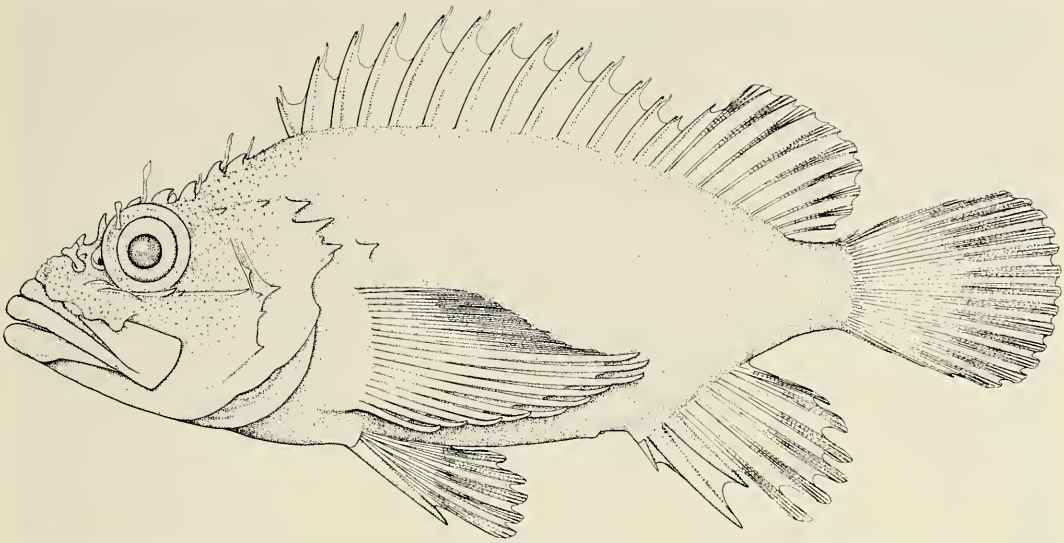

Fig. 1. Holotype of *Scorpaenodes immaculatus* in lateral view (USNM 307748, 89.2 mm SL). Walters Shoals.

with third infraorbital bone. Third infraorbital bone forming strong ridge ending in spine just anterior to preopercular spine. Nasal spine stout, slightly curved. Interorbital broad, shallow, with weak ridges; right ridge ending in small spine. Preocular spine sharp. Supraocular spine stout. Postocular spine strong. Tympanic spine strong. Coronal spines absent. Sphenotic spine absent. Pterotic spine small. Parietal and nuchal spines notably stout; broad at base. Upper posttemporal spine absent. Lower posttemporal spine small. Supracleithral spine prominent. Cleithral spine strong. Posterior margin of the preoperculum with 3 distinct spines: largest at end of suborbital ridge (stay); second ventral to but near first; third larger than second. Fourth and fifth preopercular spines absent. Anterior margin of dorsal arm of preopercle with small spine projecting laterally and slightly posteriorly. Supplemental preopercular spine a small point at base of largest preopercular spine. Operculum with 2 prominent strong spines, extending posteriorly beyond edge of bone. Maxilla extending almost to vertical with posterior border of orbit; without scales. Infraorbital bones and cheek covered with scales. Operculum covered with scales, except posteriorly. Small relatively simple cirri present on many head spines; the longest and most elaborate cirri on supraocular spine.

Body scales of moderate size, with about 50 vertical rows as counted above lateral line (damaged or missing, counted from scale pockets); scales from dorsum with about 40 ctenii in 2 alternating marginal rows and about 4 submarginal rows of ctenial bases in posterior field (Fig. 3a). Underside of head without scales. Scales on posterior part of head and on body ctenoid. Cirri absent on body.

Dorsal fin origin above middle of opercle. Anterior dorsal-fin spines tipped with simple cirri. Anal fin with second spine notably stronger and longer than third. Upper unbranched pectoral-fin rays slightly elongate; extending posteriorly to first segmented anal ray; ventral rays notably thicker. Caudal fin somewhat rounded, but with rays in ventral half slightly longer than those dorsally. Caudal skeleton with haemal spine of second preural centrum broad, weakly ankylosed to second preural centrum, not supporting caudal-fin rays; parhypural broad, free from

Fig. 2. Head of holotype of *Scorpaenodes immaculatus* in dorsal view.

hypurals supporting ventral procurrent rays, partially ankylosed to compound urostylar centrum; hypurals 1 and 2 fused, supporting 6 branched rays and 1 unbranched, autogenous from compound urostylar centrum and hypural 3; hypural 3 supporting 3 branched rays; hypural 4 supporting 2 branched and 1 unbranched ray; hypurals 3 and 4 anky-

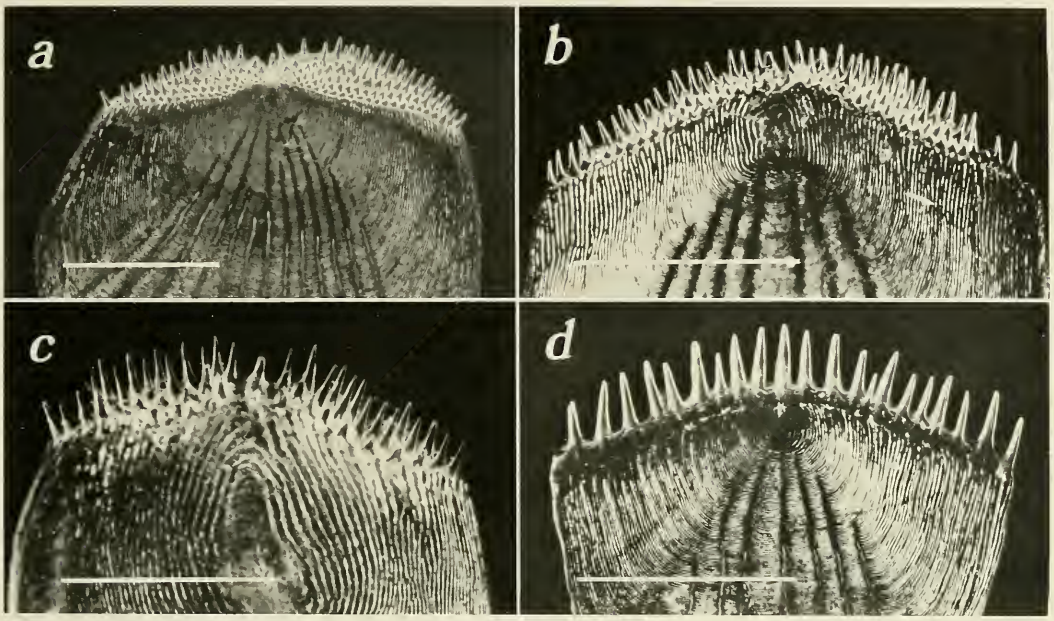

Fig. 3. Comparison of scales from dorsum above lateral line and right pectoral fin in several species of *Scorpaenodes*. a. Holotype of *Scorpaenodes immaculatus* USNM 307748. b. *S. varipinnis,* CAS 48692. c. *S. parvipinnis,* CAS 31352. d. *S. tribulosus,* CAS 24267. Bars represent 1.0 mm. Note differences in number of ctenial bases, size and number of ctenii.

losed only near compound urostylar centrum, distinctly separate posteriorly; hypural 5 autogenous; 3 broad epurals; uroneural long, autogenous; neural spine of second preural centrum broad, short.

Body uniformly red immediately after capture, with small red spots over soft fin rays and no dark brown markings. No dark brown or black spot on posterior part of spinous dorsal fin. Spinous dorsal fin with more red pigment proximally. Body devoid of markings in alcohol.

Measurements for the holotype in mm are as follows (percentage standard length in parentheses): standard length 89.2, head length 38.2(43), snout 11.0(12), orbit 10.1(11), interorbit 6.0(7), upper jaw 19.9(22), postorbit 17.8(20), body depth 31.6(35), predorsal 36.0(40), anal fin 24.6(28), caudal fin 22.6(25), pectoral fin 30.6(34), pelvic fin 22.1(25), first dorsal spine 4.4(5), second dorsal spine 7.3(8), third dorsal spine 9.9(11), fourth dorsal spine 12.2(14), fifth dorsal spine 13.6(15), penultimate dorsal spine 6.6(7), last dorsal spine 9.9(11), first anal spine 7.1(8), second anal spine 18.6(21), third anal spine 14.0(16), maximum width of interorbital ridge 2.3(3), caudal peduncle 9.6(11), snout to second dorsal spine 37.3(42), snout to third dorsal spine 39.6(44), snout to fourth dorsal spine 43.1(48), snout to fifth dorsal spine 46.6(52), first dorsal spine width at midlength 0.5(0.6), interorbital depth 0.9(1), incision of fin membrane at fourth dorsal spine 5.6(6), snout to pelvic insertion 37.7(42), opercular tip to dorsal fin 11.4(13), uppermost preopercular spine 4.3(5), first dorsal spine to fifth dorsal spine 10.1(11), fifth dorsal spine to pelvic insertion 32.7(37), first dorsal spine to pelvic insertion 31.7(36), fifth dorsal spine to last dorsal spine 24.1(27), last dorsal spine to last dorsal ray 16.4(18), last dorsal ray to last anal ray 12.6(14), anal-fin origin to last anal ray 11.8(13), pelvic insertion to anal-fin origin 31.1(35), first dorsal spine to anal-

fin origin 46.0(52), last dorsal spine to pelvic insertion 42.4(48), last dorsal spine to last anal ray 21.1(24), last dorsal ray to anal-fin origin 22.8(26), last dorsal spine to anal-fin origin 25.8(29), fifth dorsal spine to anal-fin origin 38.2(43).

Comparisons.—*Scorpaenodes immaculatus* most closely resembles *S. smithi* and *S. investigatoris* but differs from both in lacking any dark markings on head, fins, or body. These three species share the following traits: similar spination on the infraorbital bones, absence or near absence of coronal spines, similar counts and body proportions. With respect to coloration, *S. immaculatus* resembles a specimen identified as *S. smithi* that was photographed by Gloerfelt-Tarp & Kailola (1984:114), but does not fit their description, which noted the presence of a spot on the dorsal fin. Detailed study of geographic variation in *S. smithi* is needed.

Scorpaenodes immaculatus is readily distinguished from its western Indian Ocean congeners by its coloration, among other features. It differs most notably from *S. smithi* in lacking a dark spot in the posterior part of the spinous dorsal fin and the bars and markings present on the body in *S. smithi* (but see below), in having a small spine on the upper arm of the preopercle, in having XIV (if normal) rather than XIII dorsal-fin spines, and in having the upper unbranched rays in the pectoral fin slightly elongate. It differs from *S. investigatoris* in having the upper portion of the pharynx light-colored, rather than dusky-colored. *Scorpaenodes immaculatus* can be separated from *S. tribulosus* in having 3, as opposed to 4–8, spinous points on the suborbital ridge, and with less well-developed ctenii on the scales, a difference especially evident in scales from the chest, maxilla, and interorbital regions, which are thickly covered with ctenoid scales in *S. tribulosus.* It can be quickly distinguished from *S. steinitzi* by having one more dorsal fin spine and fewer segmented dorsal rays (8½ vs. 10), in having 19 as opposed to 16–17 pectoral rays, and lacking coronal spines. *Scorpaenodes immaculatus* has only 3 suborbital spines, unlike *S. parvipinnis,* which typically has from 5 to 10. The new species differs from *S. hirsutus* in having cirri confined to head and fin spines and not widely distributed over the body, in having a deeper body (35% vs. 30–32% SL), in having 3, rather than 4, suborbital spines in a row below the orbit, and in lacking a spine below those in the suborbital row. It can be separated from *S. guamensis* in lacking the large dark spot over the opercle and in not having coronal spines. It lacks the distinct dark spot on the subopercle characteristic of *S. littoralis. Scorpaenodes immaculatus* is distinguishable from *S. varipinnis* in having a wider interorbit (7% vs. 3–4% SL) and in not bearing strong dark markings over the body. It differs widely from *S. albaiensis* and *S. minor* in having well-developed nasal spines, in having a much deeper body (35% vs. 27–30% SL), and in not having the middle pectoral fin rays as abruptly longer as those dorsally.

Scorpaenodes immaculatus differs from *S. insularis,* a species known only from St. Helena in the South Atlantic, in lacking a second spine below the row of 3 spines on infraorbitals 1–3, in having a wider interorbit (7.0% vs. 4.5% SL) and a slightly deeper body (35% vs. 32% SL).

Distribution.—Western Indian Ocean, known only from Walters Shoals.

Etymology.—*immaculatus,* from the Latin meaning unstained, unspotted; in reference to the diagnostic lack of pronounced markings on the body and fins typical of other species of *Scorpaenodes.*

Discussion.—Although scales of *S. immaculatus* taken from the dorsum and immediately above the anterior part of the lateral-line have a broader series of ctenial bases in the posterior field, with respect to ctenial size and number they are otherwise similar to those taken from the same region of the body of most other species assigned

to *Scorpaenodes* (Fig. 3). The arrangement in *S. tribulosus* (Fig. 3d) notably contrasts with that of other *Scorpaenodes* in having many fewer and longer ctenii, with little trace of the development of ctenial bases. The presence of abruptly longer middle pectoral-fin rays (relative to those dorsally) was a feature used by Evermann & Seale (1907), Smith (1957), and Schultz (1966) to distinguish species of *Hypomacrus* from other *Scorpaenodes*. However, the intermediate condition observed in *S. immaculatus* is somewhat more pronounced than that figured by Eschmeyer & Randall 1975 for *S. hirsutus* and like that observed in *S. guamensis*-like specimens taken from Madang, Papua New Guinea (SGP observation).

Insular endemism is evident in several other species of *Scorpaenodes*, being known for *S. insularis* (St. Helena), *S. steenei* (Rottnest I., Western Australia), and *S. englerti* (Easter Island). Other shallow-water species, most notably *S. littoralis*, *S. parvipinnis*, and *S. guamensis*, are among the most broadly distributed of scorpionfishes. Only further collecting will determine if *S. immaculatus* occurs elsewhere. Walters Shoals is one of seven islands and sea mounts extending along the West Wind Drift from Gough and Tristan da Cunha in the South Atlantic to Amsterdam and St. Paul in the southern Indian Ocean. There is a high degree of endemism in the West Wind Drift Islands (Collette & Parin 1991) so *S. immaculatus* should be looked for around the other islands and sea mounts of this chain.

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